



GUILTY GEAR Xrd Development Staff

Anime Style Character Modeling TIPS



About today's talk



Speaker Profile

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Arc System Works Co.

Lead Modeler / Technical Artist / Various others

I was a modeler and wanted to write shaders, so I became a technical artist.

Modeling, rigging, shader creation, giving talks, etc.

Currently in charge of technical art support and R&D.

Representative Works

⇒ **GUILTY GEAR Xrd Series**

Lead Modeler / Technical Artist

⇒ **DRAGON BALL FighterZ** (Bandai Namco Entertainment)

Director / Modeling Supervisor / Technical Artist

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Based on a character model from the Guilty Gear Xrd series, I will show the process of making a 3D object from a drawing.

PART2: Creating a face shape that won't Break

Common mistakes beginners make and how to avoid them. These are some tips on how to make anime shapes while maintaining 3-dimensional consistency.

PART3: Practical Normal Editing

How to control normals to get shadows of any shape. I will explain:
“What are normals, in the first place?”

About this talk

Any type of 3D software is acceptable.

As this lecture is a sequel to the previous lecture on "GUILTY GEAR Xrd", Softimage will be used for demonstrations. However, we have chosen tips that can be applied regardless of the software.

Focus on creating mesh shapes.

I won't be covering special shader techniques or how to draw textures. the main focus of the talk is on how to shape the polygon mesh. There will be some discussion on bones and skinning, but I won't speak on animation.

It's about polygon modeling.

Because Guilty Gear Xrd doesn't use sculpts, there will be no mention of Normal Maps. Instead, I'll talk about **Vertex Normals** a lot.



Part1

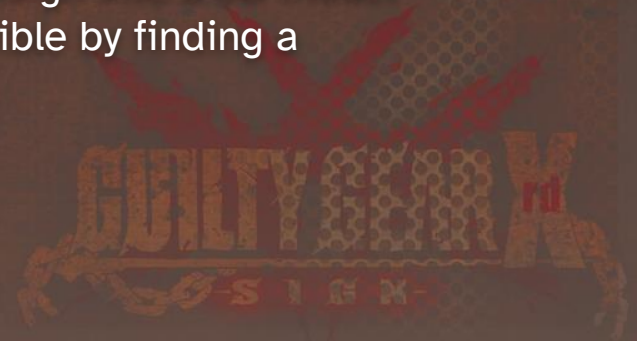
The Modeling Workflow of Guilty Gear Xrd



Our Modeling Goal at ArcSys

How to draw out the appeal of a character with a 3D model.

- ⇒ I want to transmit the appeal of the 2D character design into a 3D model
- ⇒ I want to create a model that is as versatile as possible by finding a compromise between 2D design and 3D convenience.



What to focus on when starting



⇒The most important thing to start with is recreating the silhouette

⇒Proportions can completely change the impression you give



The slightest difference will affect the feeling

Head Size -5%

Head Size +5%

Simply scaling the head by 5% can make a character look more mature, or more childlike.



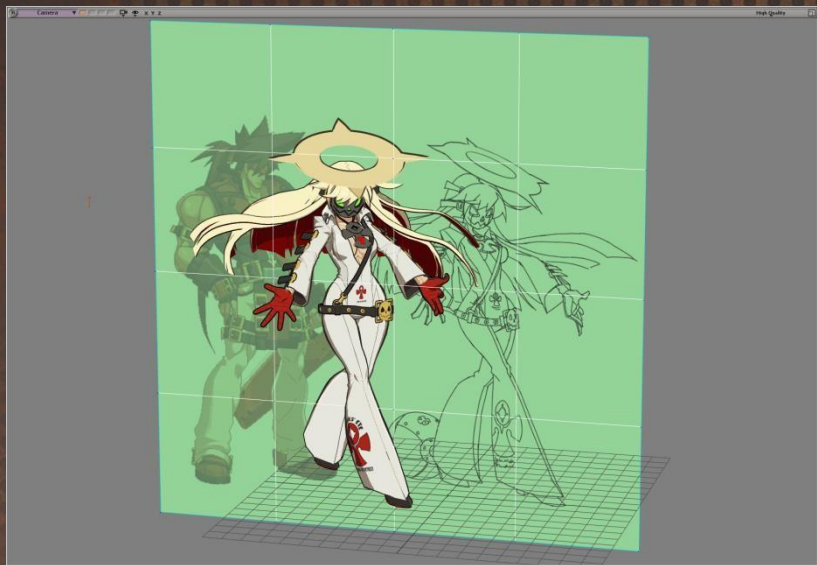
GGXrd Workflow

Modeling based on a picture



TIPS : Put the original image next to the model!

By placing it right next to the model, you can see the differences at a glance!



It's a good idea to make the reference square, to ensure there's no aspect ratio distortion.

⇒ **Place it directly in your viewport**, not in a separate window or something.

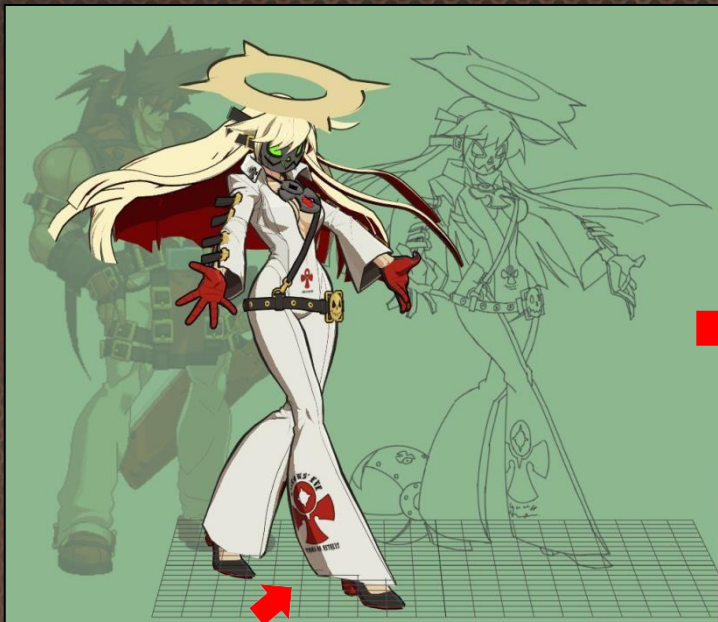
⇒ You don't have to put it on top of the mesh you are working on. Displace it so you can compare both.

Huge benefits:

By placing them in the same window, you're able to directly compare the sizes and ratios of the figure.

Match the balance by comparing to the original

Example:



“Huh? Are my legs a little too long?”



“Is this about right, based on the concept?”
→ Correction

A suitable reference

⇒The view you will see most often in the product, or the most demonstrative.

⇒For fighting games, this is often the so-called “idle pose”.

⇒It's important that the proportions of the limbs, head and body are clearly understandable.

→Avoid images with a strong perspective, such as high or low angles.



Good reference, you can easily tell the length of the limbs.

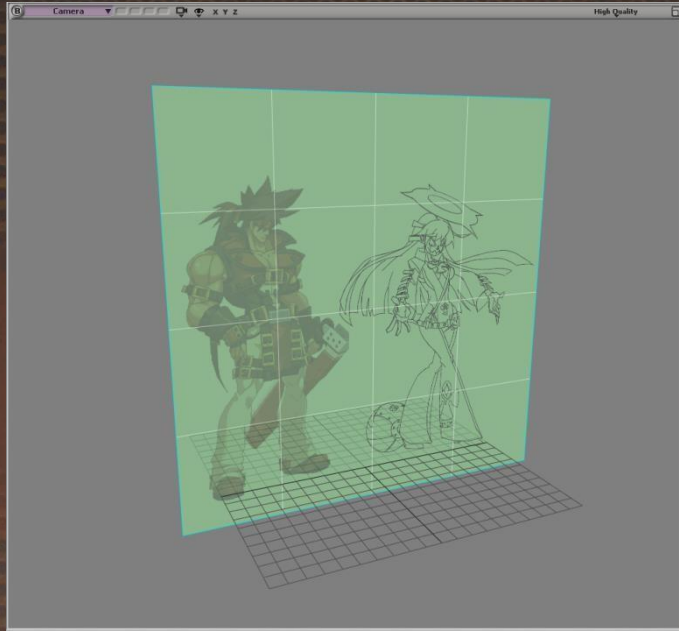


A bit of a high angle, so not great as modeling reference.

Workflow of modeling from reference



Placing and scaling the reference



Place the reference as a textured plane within the 3D viewport.



Adjust the character size based on another existing character model.

Modeling from reference #1

When modeling from scratch without a base mesh:



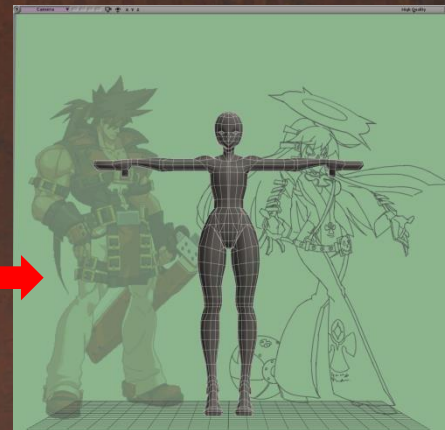
Start modeling based on the reference.



Roughly outline the torso.



Create limbs while referencing the original drawing.

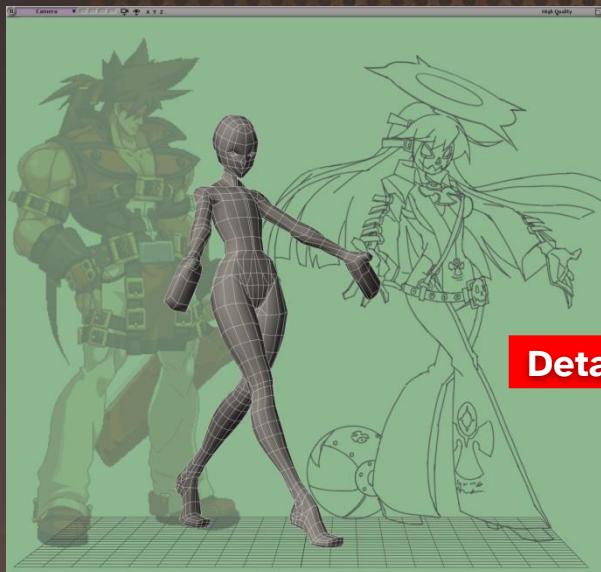


Place the limbs according to scale.

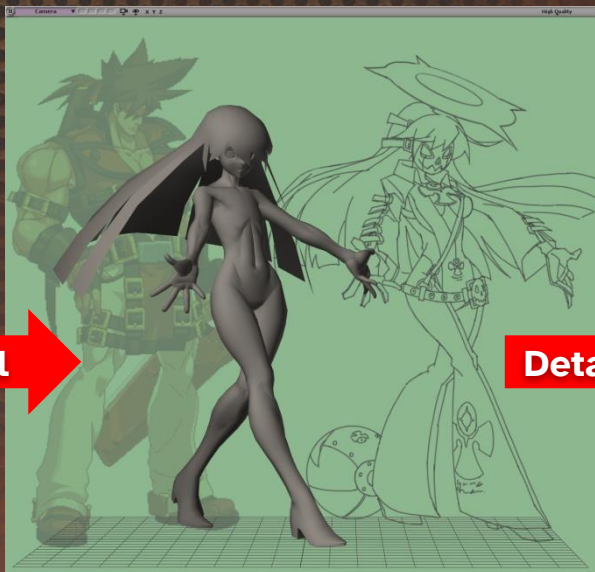
⇒ If you already have a base mesh with a similar physique, you can start your model from there.

⇒ In that case, start by matching the overall physique from the reference.

Modeling from reference #2



Detail



Detail



Put the bones in during the low-poly stage and make the reference pose. Adjust the proportions here.

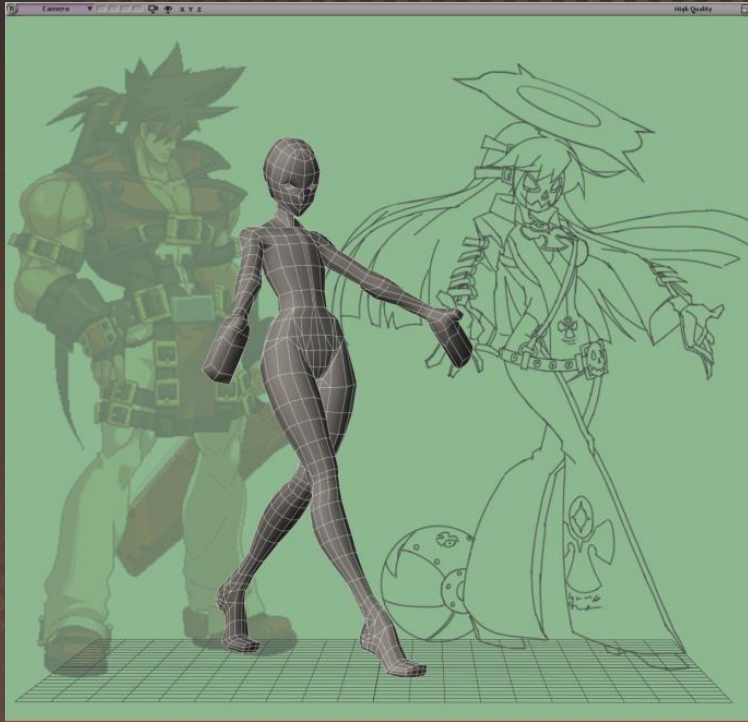
Compare the pose and the reference. Adjust the balance accordingly.

Textures and details are added once the silhouette is set. Match everything according to the reference.

TIPS : Add bones as soon as possible.



TIPS : Add bones as soon as possible.



⇒ In a T-pose or A-pose, it's hard to tell whether the length of the limbs matches the reference.

⇒ Before finalizing the model, pose it the same as the reference image, while in the very low-poly stage.

⇒ This preliminary rigging isn't necessarily final.

⇒ Ideally, you should be matching the proportions from the reference just with the base mesh and bone rotation, without having to use any advanced rigging or scaling.



Summary: Modeling from reference



Summary: Modeling from reference

- ⇒ Basically, what we're doing here is copying from 2D to 3D.
- ⇒ All you need is **eye-copying powers. Observation, interpretation and reproduction**, not tracing.
- ⇒ However, the goal is **not to 100% perfectly reproduce the reference**.
 - "Perfect reproduction of reference" is **not always** the same as a "High Quality Model".
- ⇒ If you're too particular about a complete reproduction of the reference, and neglect other areas, you will end up with **a model that isn't good enough**.
- ⇒ What is important is that the complete model **expresses the character**. In the end, the **reference is only a guide**.

Part2

Creating a Face Shape that won't Break



Why do anime-style faces “break”, anyway ?



Premise: Anime faces are broken to begin with.



Because the stylization of the face comes from **exaggeration** and **omission**, it's inevitable.

In fact, often the “inaccuracies” are the source of the appeal.

There's a type of face that is less likely to break

For example...



(?)

The more realistic the face is, the less likely it is to break.

("Realistic" in a sense, of course.)

The more deformed it is, the more likely it will have issues.

There is no way to completely prevent breaking

An anime-like face = Extreme and “Surreal” deformation.
Therefore, it’s hard to completely create it as a 3D solid.

“Breaking is inevitable” So you have to use bones, morphs, etc.,
and modify them as necessary.

But does that mean there’s nothing we can do on the model itself?
To avoid breaking as much as possible, and to get closer to the ideal look
there are many things that can be done.

Why is it so difficult in the first place?



It's easy to reproduce the look from
1 direction

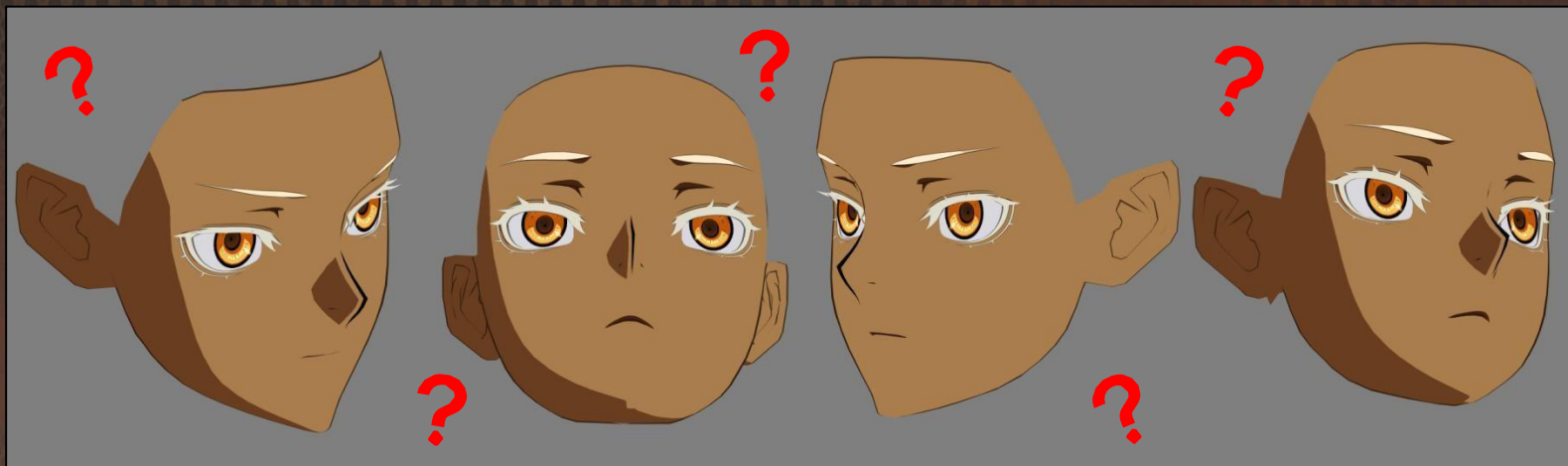
(If you do it on a plane, it's possible to match it
100%)



It's possible to reproduce the look from 2
directions

(You can shift vertices back and forth to match
the depth)

The difficulty of modelling a deformed face



As you try to define looks from several directions, the difficulty rises!

From this point on, you **can't just "trace"** from three views. This is the area where **your skills as a modeler will be tested.**

TIPS : First, let's make a Diagonal View face



TIPS : First, let's make a diagonal view face



⇒ This is the most common angle. Front and Side views are rather rare.

⇒ There are many stylized parts that cannot be read from the front or side.

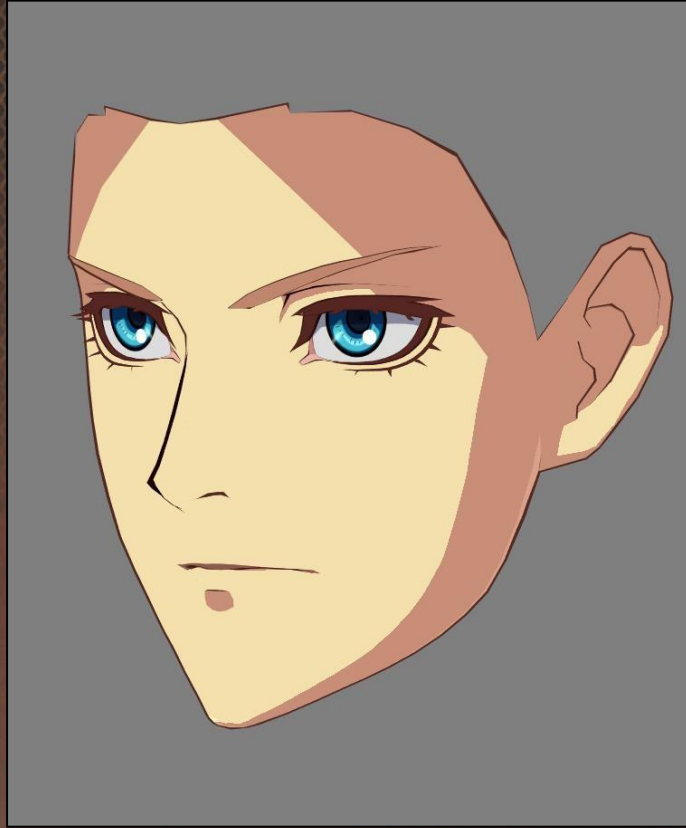
⇒ Because it's in the middle, if the diagonal face looks right, it's easy to get the other angles in-between.

How to make a diagonal view work

**“Making a diagonal view”
means:
Create a “three-dimensional” face**

**Achieving both anime-like deformation
and three-dimensionality to minimize
breaking.**

What to remember when creating a diagonal view



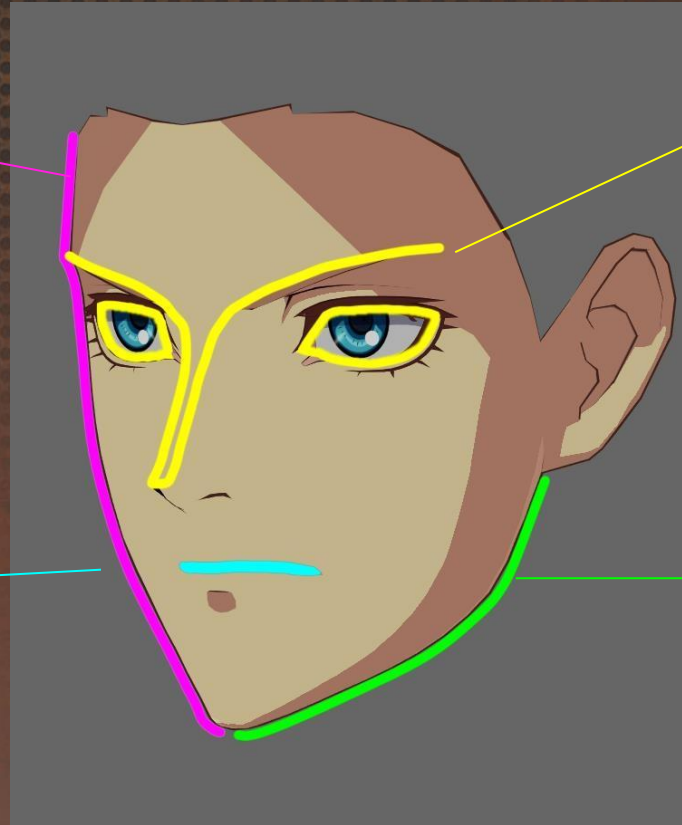
What to remember when creating a diagonal view

Cheek line

Eyebrows and Eyes

Retracted
mouth

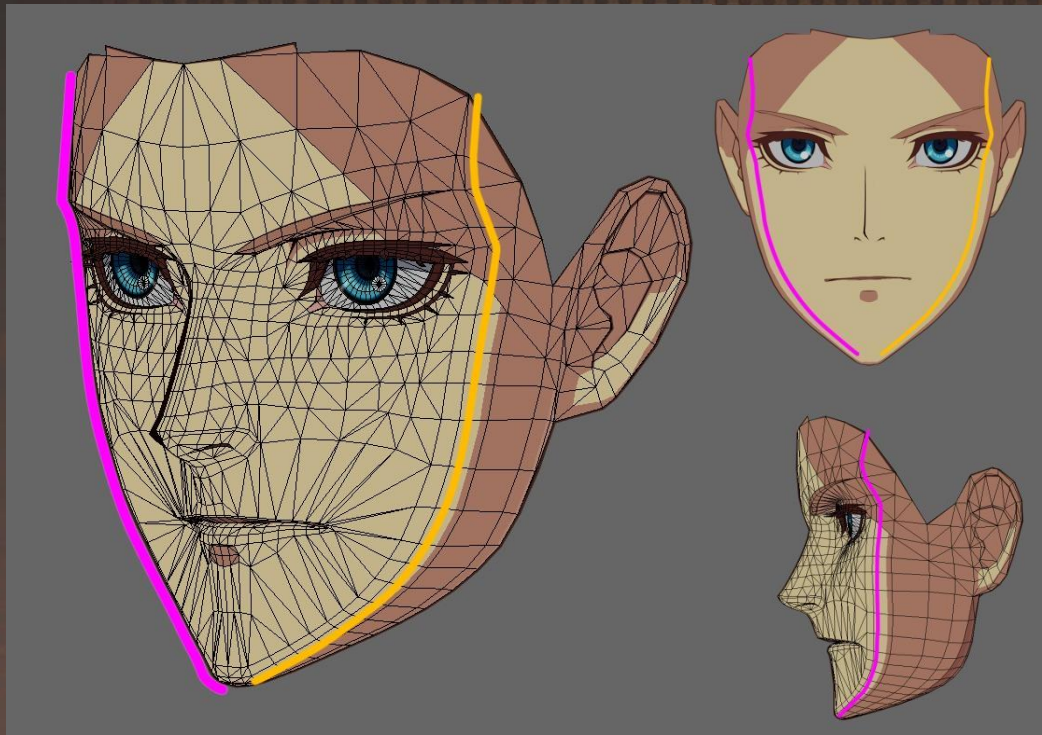
Jaw line



TIPS : Adjust the cheek line!



TIPS : Adjust the cheek line!



→These lines are invisible in front and side view.

→They greatly influence the feel of Sharpness, Softness and Ruggedness of the character.

→This line is the lifeblood of “bishonen” or “bishoujo” characters.

TIPS:

→Create a dedicated edge to define this line, and split the polygons accordingly.

→Do not spare polygons to get the exact line you want.

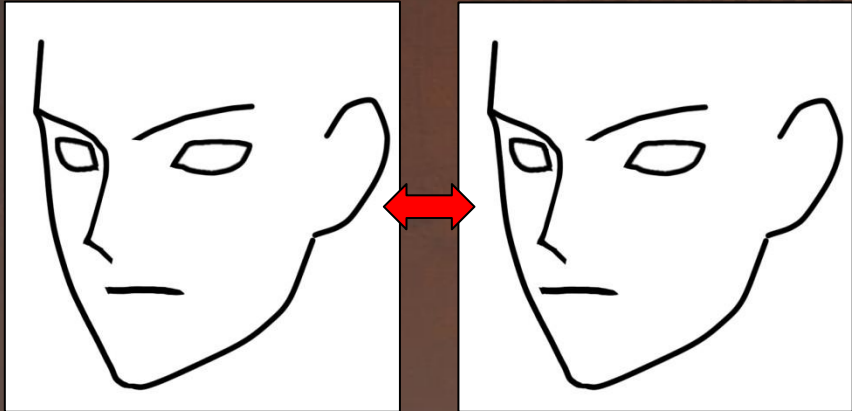
Retracting the mouth in a diagonal view



Retracting the mouth in a diagonal view



- A common feature in the anime style is to draw the mouth slightly retracted, when the face is at an angle.
- This is important if you want a sharp mouth
- If you don't do this, it can look sloppy.



This effect can also be achieved by using bones, or morphs depending on camera angle, but we can create this effect from the start, by making some adjustments while modeling.

TIPS : Pull the corners of the mouth back!

Explanation

DEMO

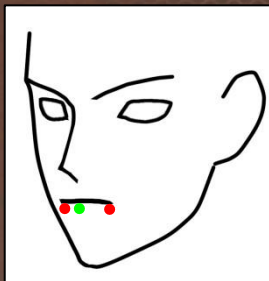
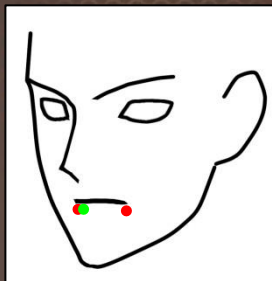
GOOD

POV



NG

PO



Push the corners of the mouth backward.
When you create depth across the mouth, you affect the diagonal view.

Hypothesis: The style of anime may itself be trying to allude to this sense of depth.

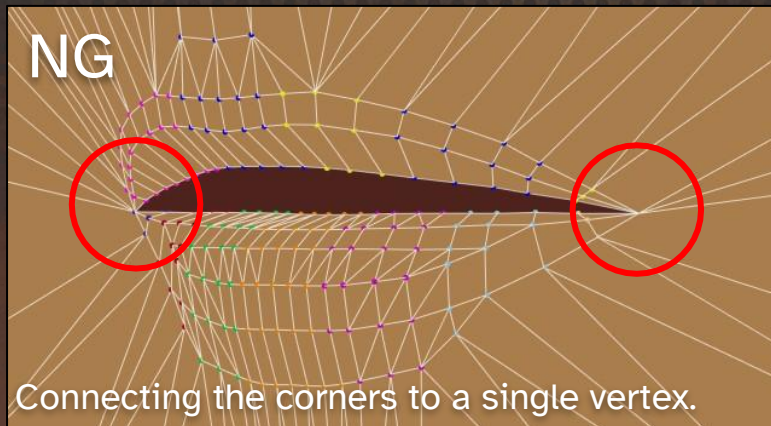
TIPS:

⇒ Push the corners of the mouth back to create the illusion of depth.

⇒ Be careful to erase the contour lines around the lips.

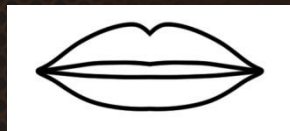
Common Beginner mistakes: Mouth modeling

NG

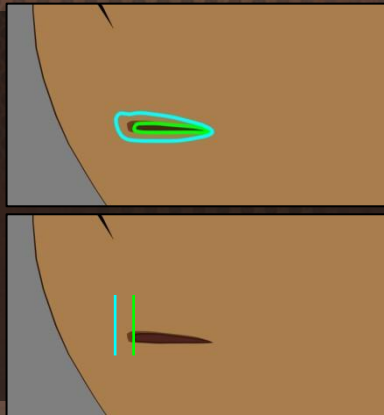
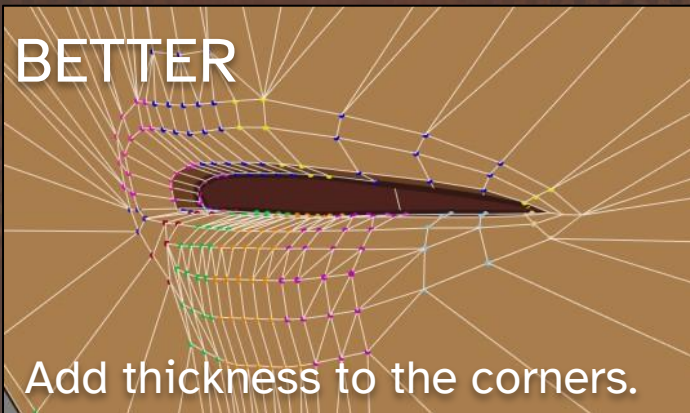


⇒ It looks unnatural, especially when the mouth is open.

⇒ Too tied to the symbol of “Lips”?



BETTER



TIPS:

⇒ By adding thickness to the corners of the mouth, the structural credibility is enhanced.

⇒ It further pushes the mouth back, slightly.

⇒ It looks more natural when the mouth is open.

Three Dimensional Eyebrows



Three Dimensional Eyebrows



⇒An important element of a
“Handsome” face.

⇒Especially important because, being
around the eyes, generally the focus
point, the slightest mistake can cause
discomfort in the viewer.



How to capture the eyebrows and forehead

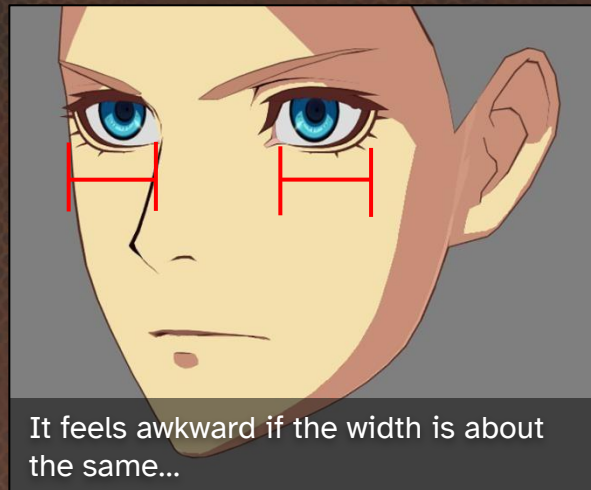
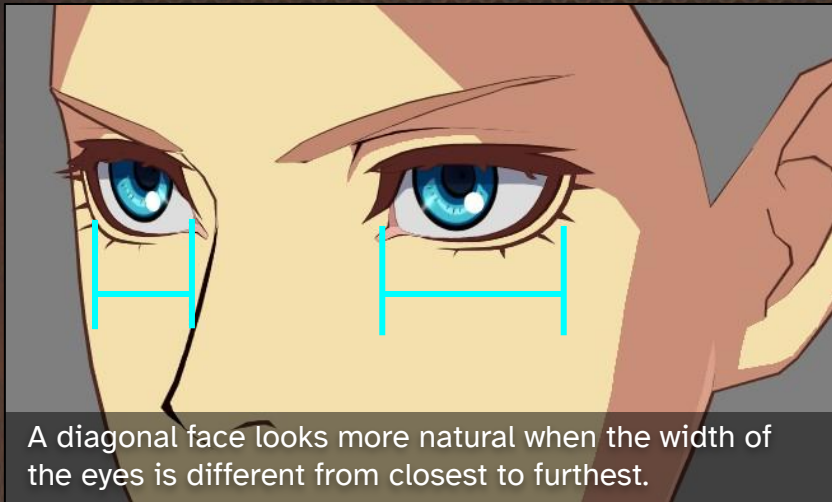


⇒ The distance from the top of the eye to the space between the eyebrows gives the impression of “finely chiseled” features.

⇒ It's easy to think the forehead is flat, but it is only flatter near the center.

⇒ The distance between the forehead and the eyes is deeper the closer to the center of the face.

Shaping the Eye: The Key is a difference in width

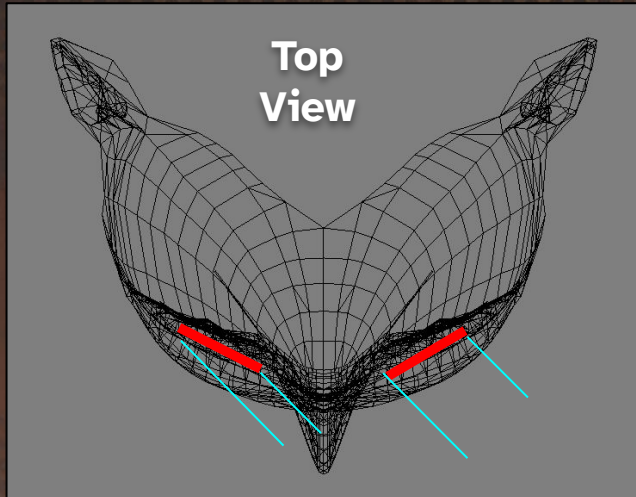


⇒ In anime faces, the width of the eye furthest away is dramatically narrowed.

⇒ The style exaggerates the sense of three-dimensionality by changing the width between both eyes.

⇒ Even a real life person changes a little, so this stylization makes sense.

Common Mistakes when shaping the eyes



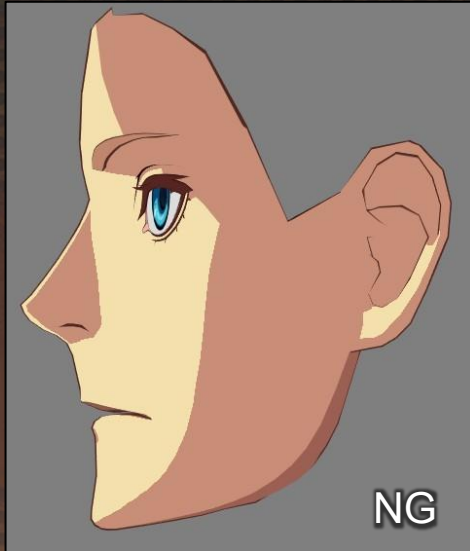
Trying to achieve the width difference by **placing flat eyes diagonally**.



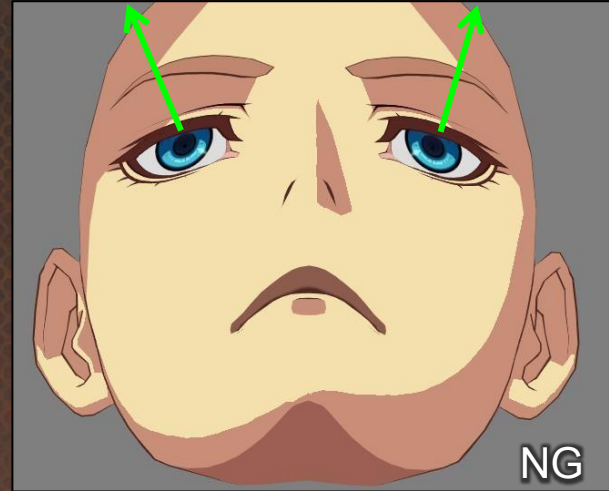
The width is narrowing nicely, at first glance.

Sure, the width changes, but...

Common Mistakes when shaping the eyes



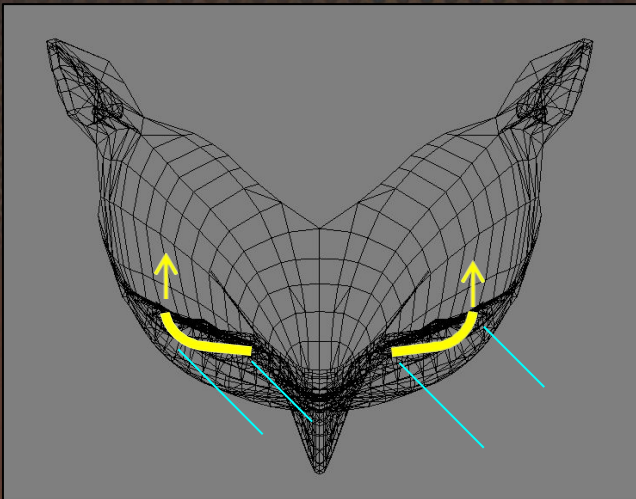
Even in profile, you can see the white of the eyes, which is unnatural...



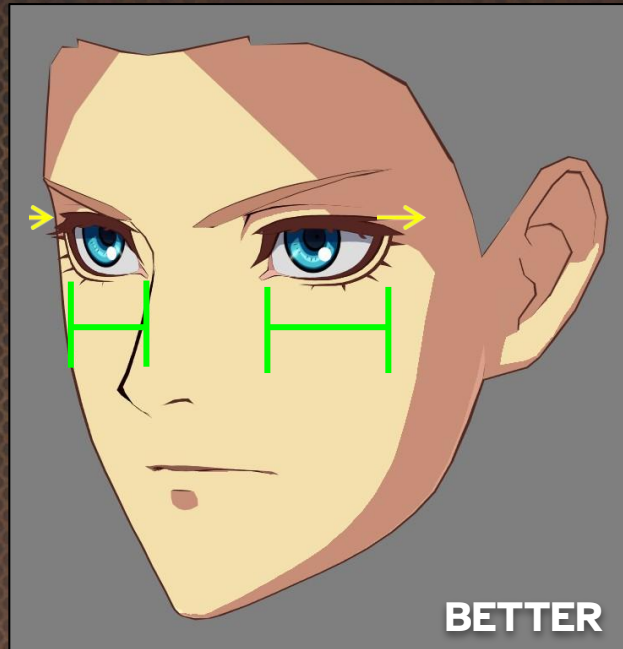
From a low angle, you get droopy eyes, or the eyes seem to be unfocused...

**This results in several problems for other angles!
So what should I do!?**

TIPS : Better Eye Shaping Techniques



It's better to create a width difference by shifting the corners of the eye back.



⇒ Instead of slanting the entire eye, move only the corner of the eye back, to create the illusion of depth and an eyeball-like roundness.

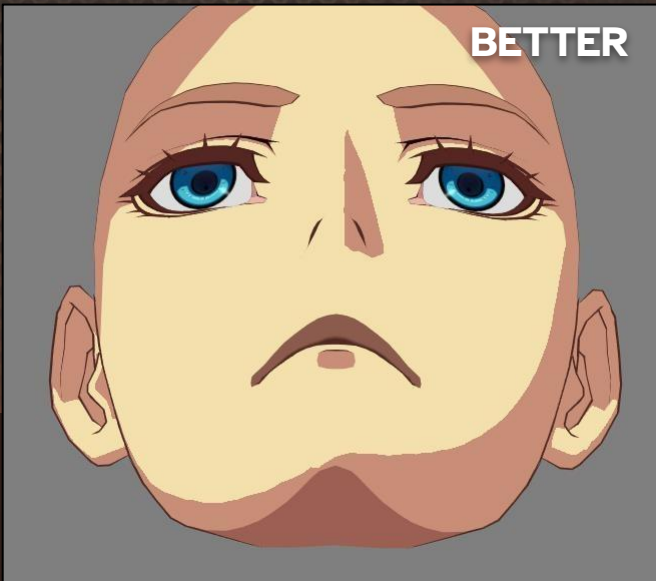
⇒ Even large anime eyes can be changed like this, to some extent.

TIPS: Better Eye Shaping Techniques

BETTER



BETTER

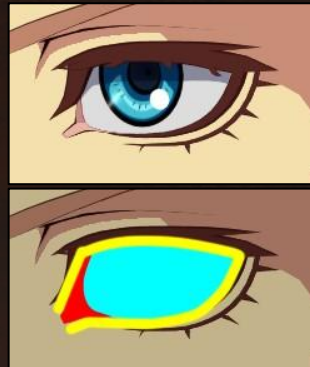


⇒ By re-shaping the eyes three-dimensionally, they're less likely to break when viewed from other angles.

⇒ In the end, it boils down to “Let’s model it properly, **while taking into account the three-dimensional aspects of reality**”.

⇒ Even if you **don’t model the eyeball**, just considering the three-dimensionality of the **shape of the eyelids** makes all the difference.

TIPS:

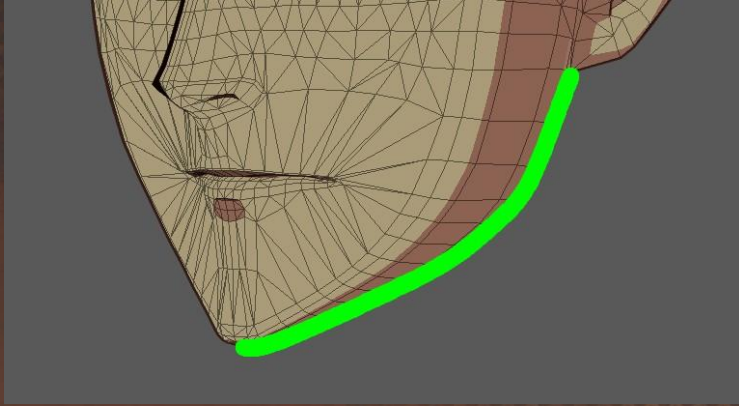


3D Shape Interpretation is Key!

Jaw line



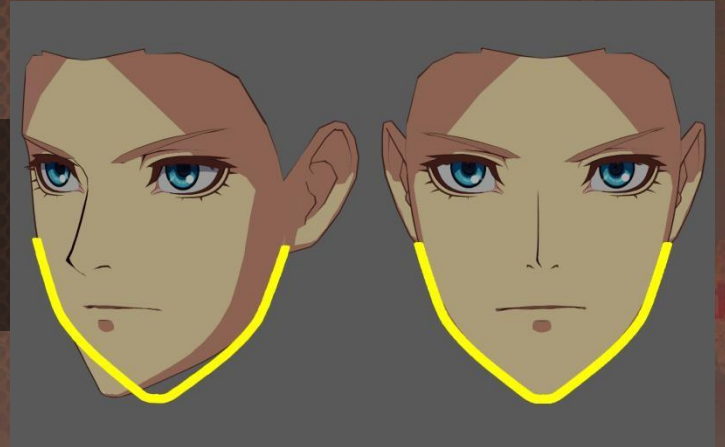
Jaw line



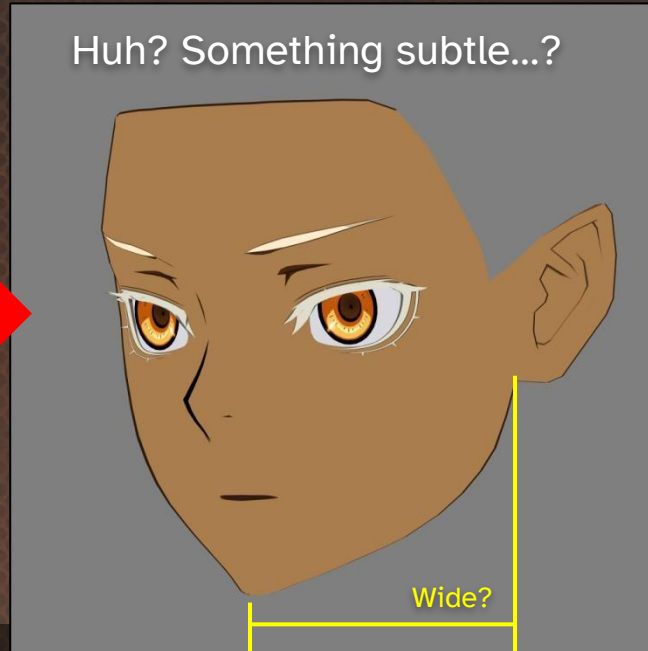
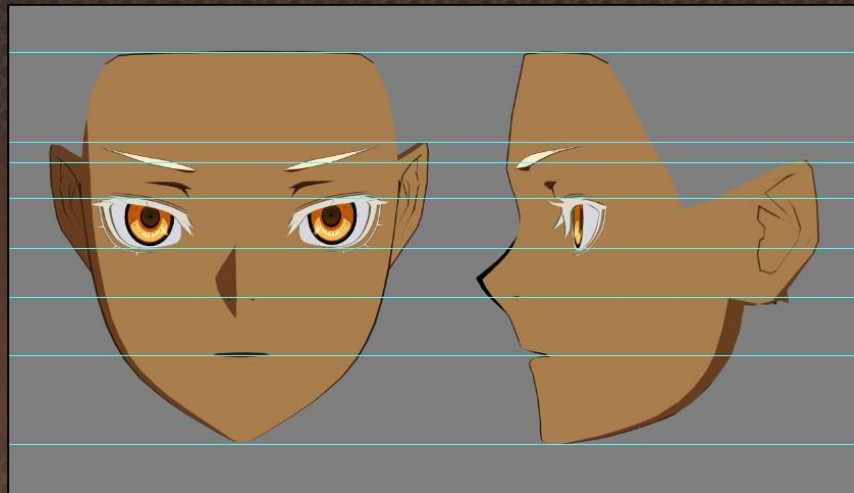
- ⇒ Along with the cheek line, **this line forms the contour of the diagonal view.**
- ⇒ The distance between these two lines defines **the width of the diagonal view.**
- ⇒ Like the cheek line, **it greatly affects the sharpness or ruggedness of the character.**

In order to have a consistent look, we want to align the width of the face from the front, with what we see diagonally, to some extent...

 **This tends to be a problem...**

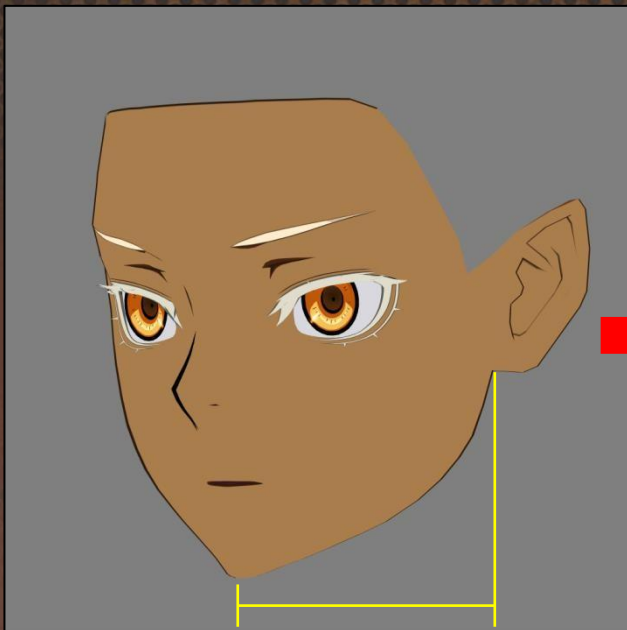


Common Problem: The Diagonal View is too wide.

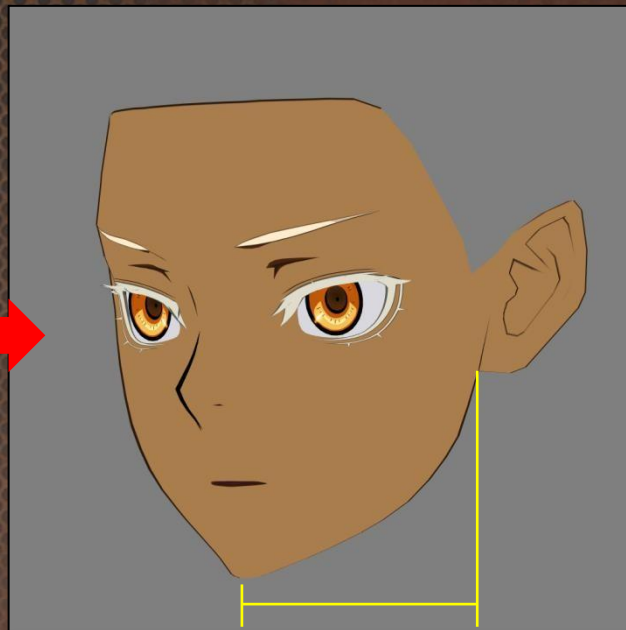


The front and profile faces are just as I imagined them, but when you look at it diagonally, the face is just too wide and ruins the look.

I want control over this width



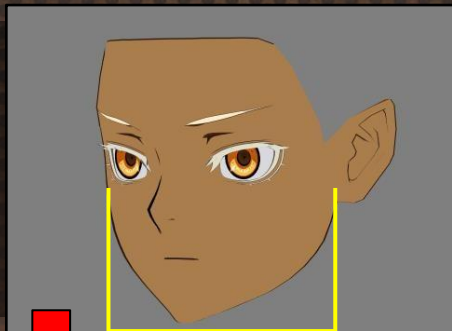
Strangely chunky...



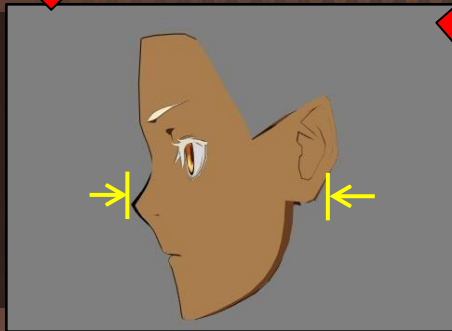
I wish it was this wide...

A common chain of mistakes in diagonal views

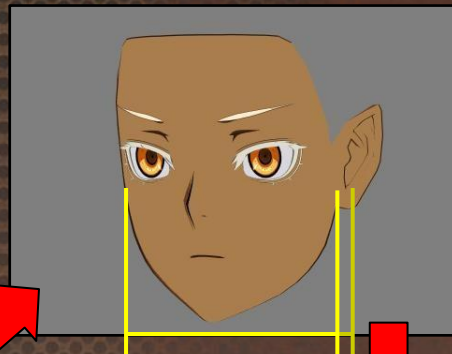
The diagonal view looks too wide...



I don't want to mess with the front view, so I sacrifice the "low-priority" side view and try to squish the face back and forth.



The width of the face is narrowed and the problem is solved. However...



After all the squishing it looks like a **festival mask**, with no three-dimensional effect.

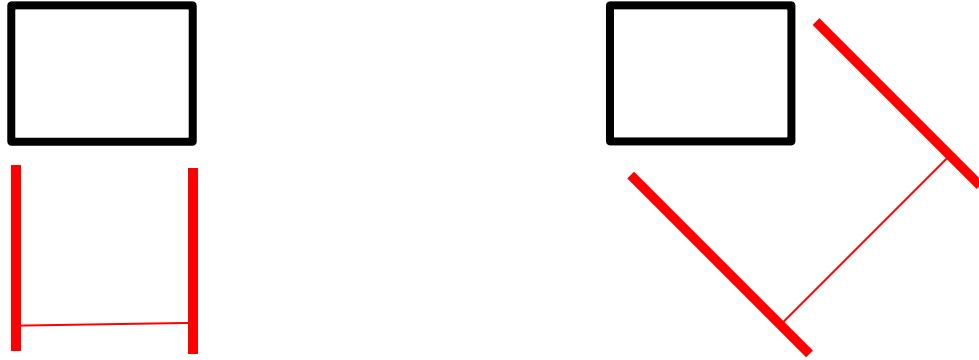


→As a result, the shape **quickly collapses in low or high angle views.**

DEMO

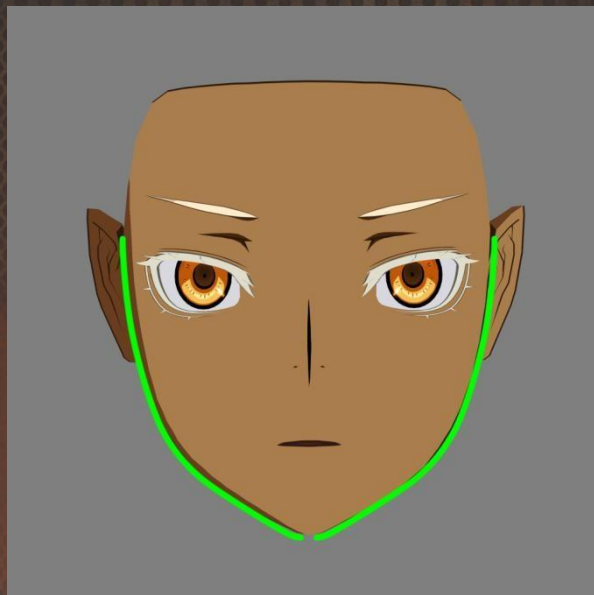
Analyze the cause: If you know it, you can solve it

Why does it even look extended when viewed from that angle?

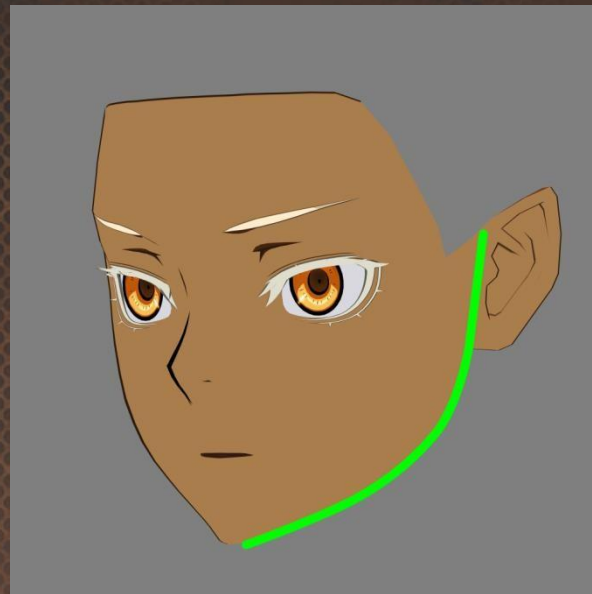


Objects with clear sides increase in width when viewed from an angle.

TIPS: Separate the jaw line from the contour line



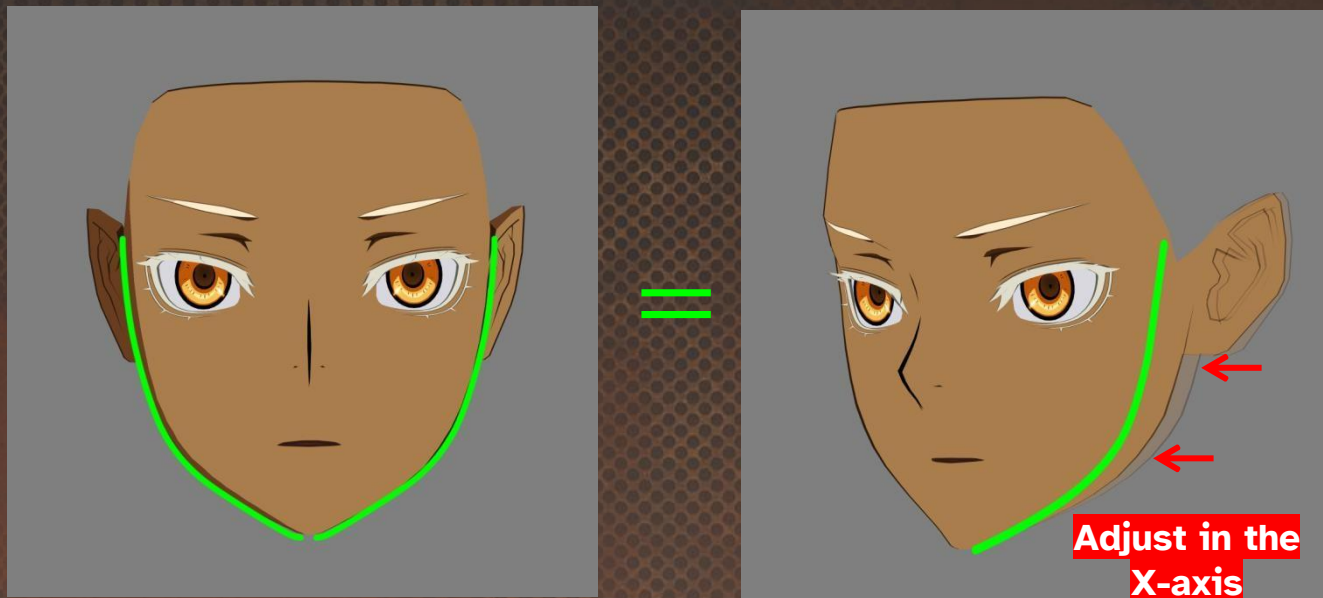
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⇒ The root cause is **confusing the frontal face contour with the jaw line**.

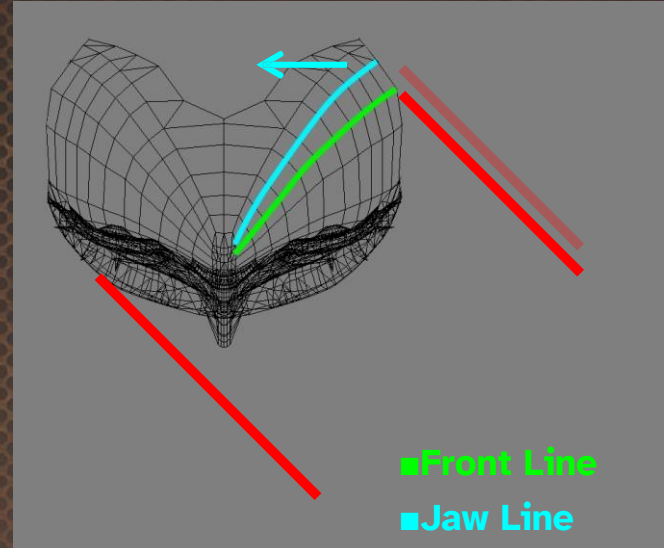
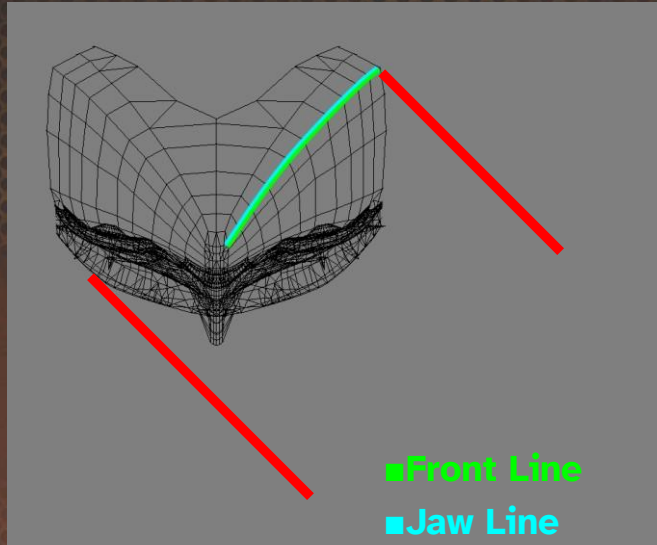
⇒ This is a **common pitfall** when modeling by drawing vertices out from the front of the face

TIPS: Separate the jaw line from the contour line



- ⇒ The contour line of the face is **the widest** part of the face.
- ⇒ The contour line of the face defines the **ridgeline before the jawline**.
- ⇒ **By narrowing the width in the X-axis**, you can obtain the jawline you want.

A diagram of the solution

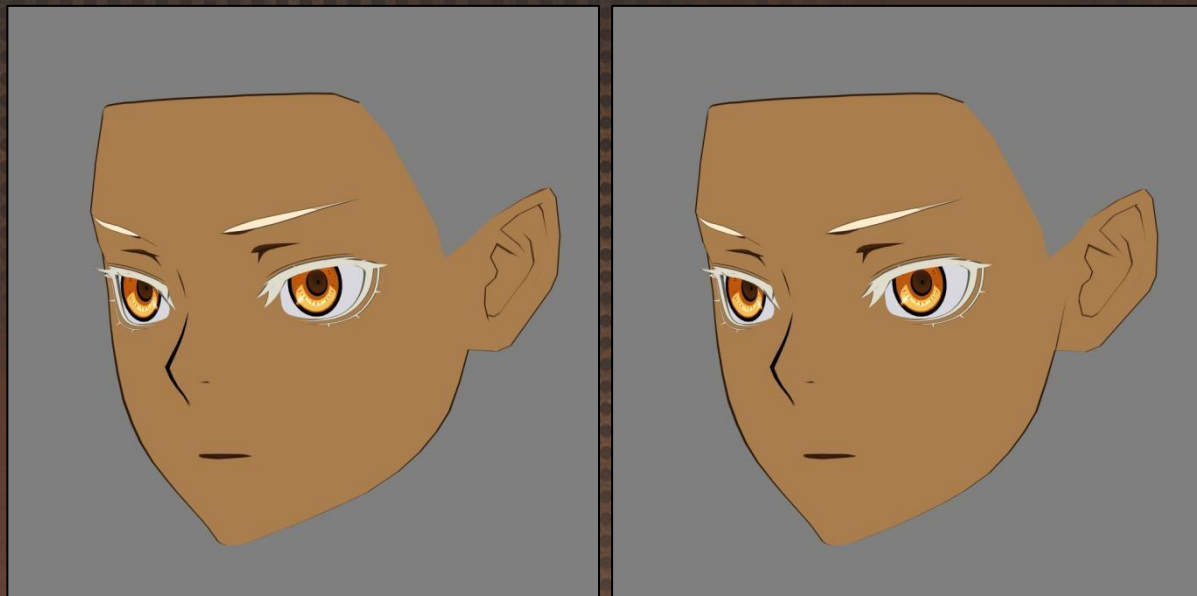


⇒ The **frontal contour line** is seen in front of the jaw line.

⇒ The width of the overall diagonal view can be adjusted by narrowing the **jaw line** sideways.

⇒ If you don't do this, you won't even have a front line defined at all.

Comparison



- ⇒ I was able to adjust the width of the diagonal view without changing the appearance of the front or side views.
- ⇒ The key to solving issues is to identify their causes without being bound by preconceptions, and to think flexibly.

Summary: Creating a face shape that won't break



Summary: Creating a face shape that won't break

⇒ When you aim for “**style above reality**”, some kind of breaking is inevitable.

⇒ The best way to deal with this is to use bones and morphs on a case-by-case basis.

⇒ However, this can be mitigated by planning the model itself.

⇒ The objective is to have both stylized deformations and three-dimensional consistency.

⇒ Plan the three-dimensional consistency in a range that doesn't detract from the charm of the style.

⇒ To achieve this, we use surprisingly realistic modelling techniques.

Part3

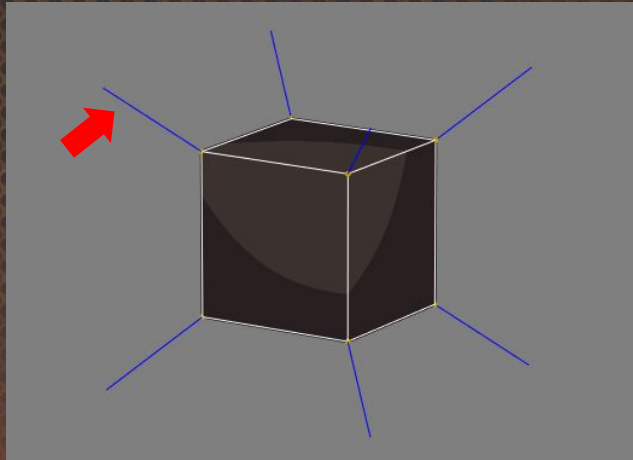
Practical Normal Editing



What are normals, in the first place?



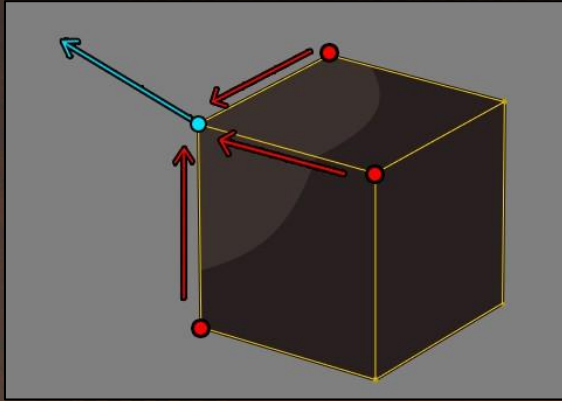
What are normals, in the first place?



- ⇒ The direction of each vertex is represented by a vector
- ⇒ It is defined by three values representing each axis (XYZ)
- ⇒ Put simply, the results of lighting greatly depend on the orientation of vertices and the orientation of the light source.

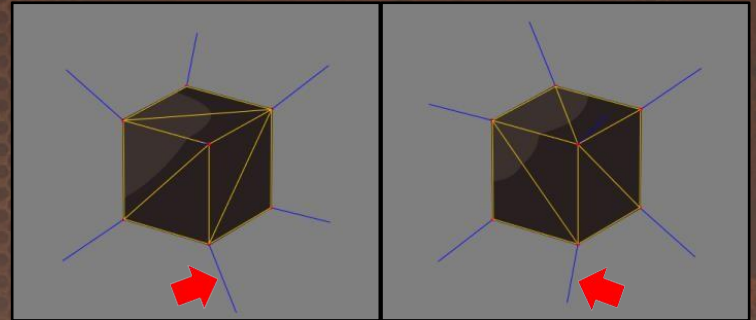
How are normals determined?

Usually, they are automatically calculated by the 3D software.



⇒ They are calculated from the positions of connected vertices.

⇒ This is why the shadow changes depending on how edges are connected

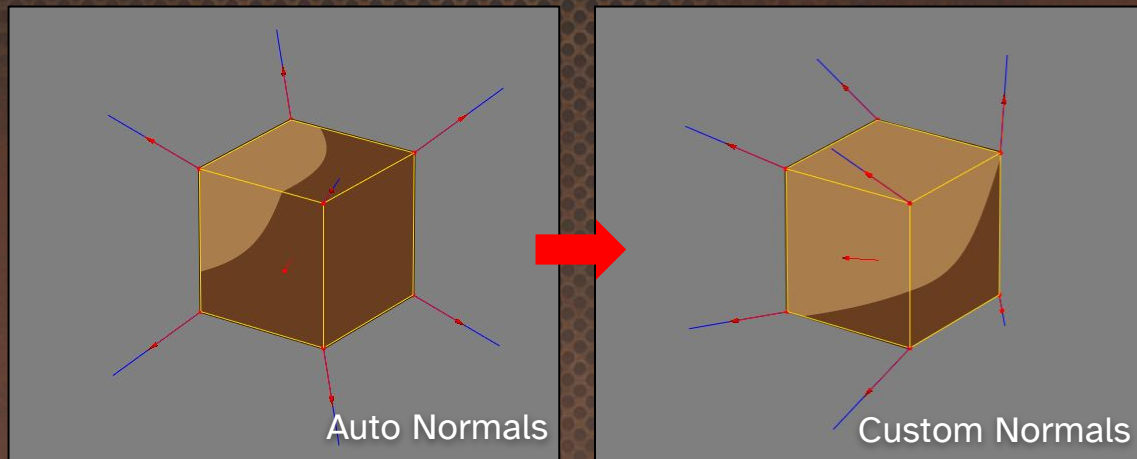


An example of the shading changing depending on how the faces are divided.

So what is normal editing?

Normals are set automatically, but users can change them to any direction.

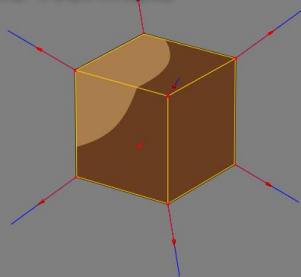
(Usually referred to as “Custom Normals” or “User Normals”, depending on the software.)



You can directly affect resulting lighting by overwriting the normal directions!
→ This is very useful for celshade styles which require stark shadows.

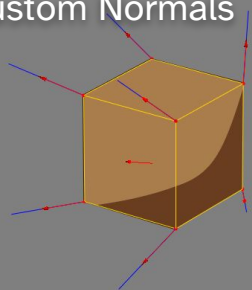
Results of normal editing

Auto Normals



Lighting depends on the shape of the mesh (position of vertices). If you want to get a good-looking lighting result, you are dependent on the mesh shape.

Custom Normals



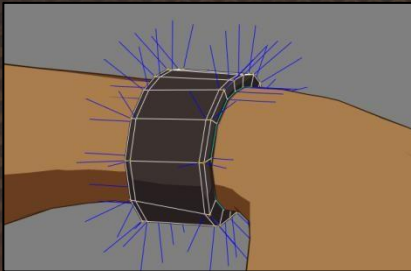
But by separating the shape of the mesh from the lighting results, you can get lighting results that would otherwise be impossible.

Important: The mesh and the resulting lighting can be separate.

Several methods to control normals

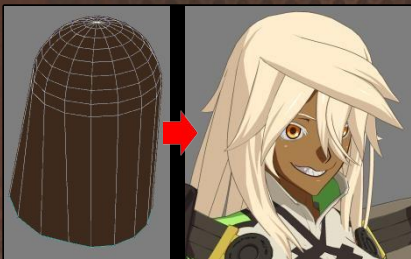


Several methods to control normals



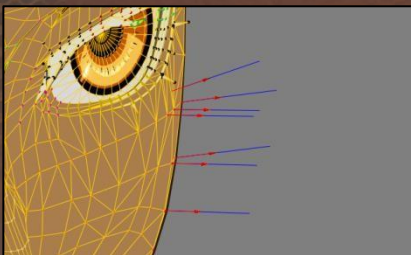
Controlling Normals via modeling

Control the direction by placing vertices during modeling.



Transferring Normals

Transfer normals from a mesh with a different shape.



Manual control over Normals

Manually edit the directions of normals.

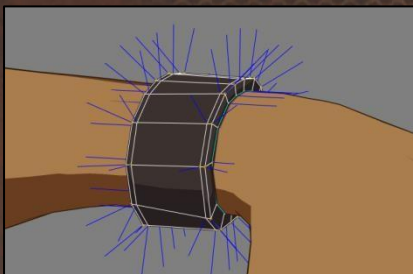
You have to put all of these methods into use, depending on the purpose.

Controlling normals via modeling



Controlling normals via modeling

Beginner Level: Control Normals without editing them.



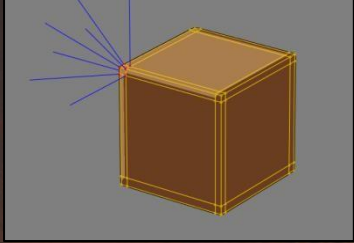
“If the vertices define the normals, then I should arrange them to get what I want!”

⇒ If vertex placement defines the direction of the normals, then why not just place them to get the results we want?

⇒ I think a lot of people do this unconsciously, but if you understand the theory, you'll get better results.

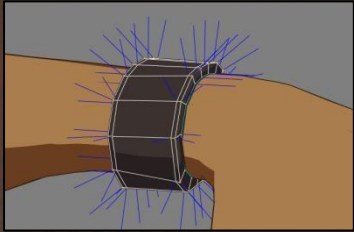
⇒ A very important method for models that doesn't use normal maps.

DEMO : Controlling normals via modeling



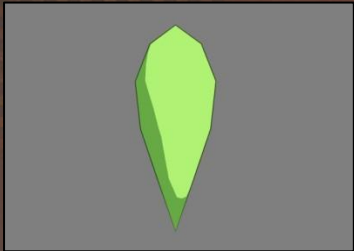
DEMO

Controlling the shadow of a box.



DEMO

Controlling the shadow on the wristband.



DEMO

Controlling the shadow of a lock of hair.

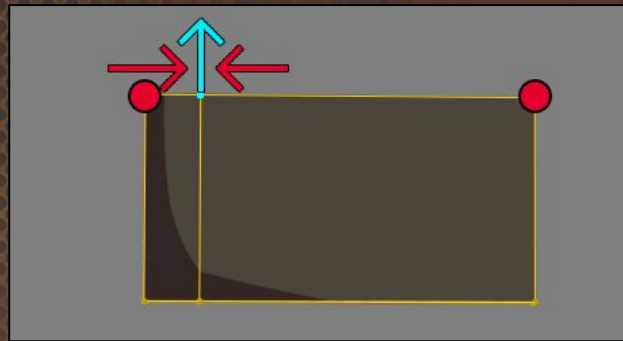
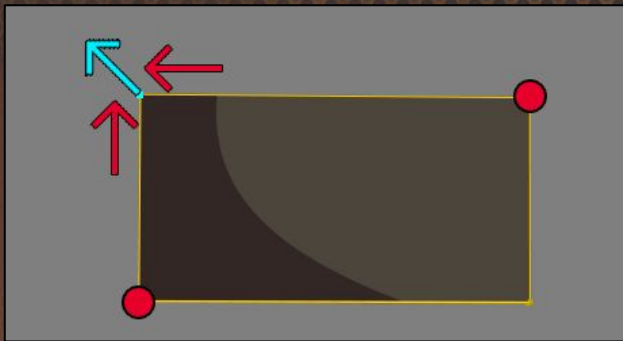


Controlling Normals via modeling: The Theory

⇒The positions of adjacent vertices affect vertex normals.

→By placing new vertices on an existing edge, you can get a normal that's **perpendicular to the edge**.

→You can adjust the resulting lighting depending on where on that edge you place the vertex.



⇒You can improve your lighting by using this on the edges of clothes and the tips of hair.

⇒At ArcSys, we call these vertices “suppression” vertices.

⇒Since it's a useless vertex in terms of silhouette, it's a disadvantage in terms of geometry “cost”.

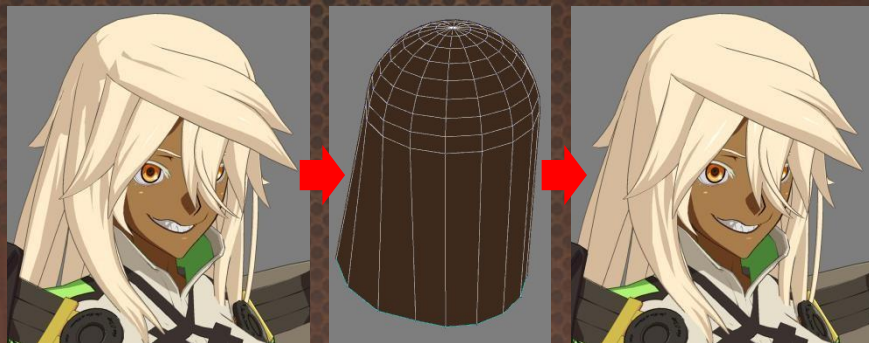
→ But when it comes to the style, it's worth it.

Transferring Normals



Misconception that has to be cleared up.

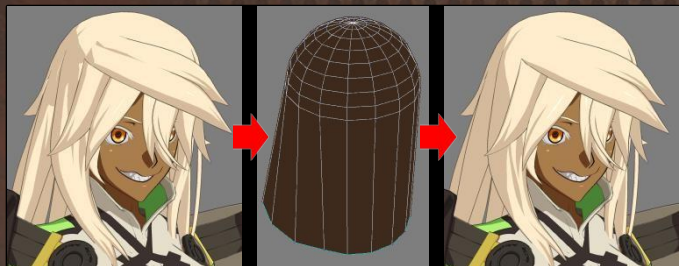
Normal Editing \neq Transferring Normals



Transferring Normals is only one of the available methods.

Transferring Normals

Intermediate Level: Transferring normals from another mesh



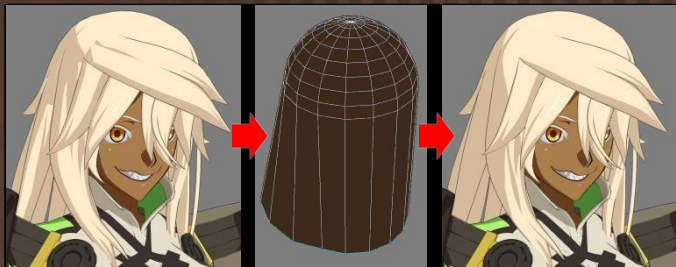
“Your normals are looking good. Can I have ‘em?”

⇒ By transferring the normal information from a different mesh, you will change the lighting, based on that original shape.

⇒ Not really suitable for finer control over shadows. Often used to get smoother shadows overall.

⇒ It is often used to prevent unnatural shadows in “card”-based geometry, such as vegetation.

DEMO : Transferring Normals



DEMO

Transferring normals to hair.

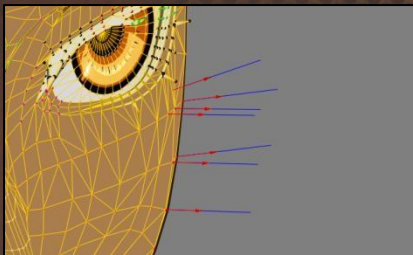


Manual Control over Normals



Manual Control over Normals

Advanced level: Edit individual normals manually.



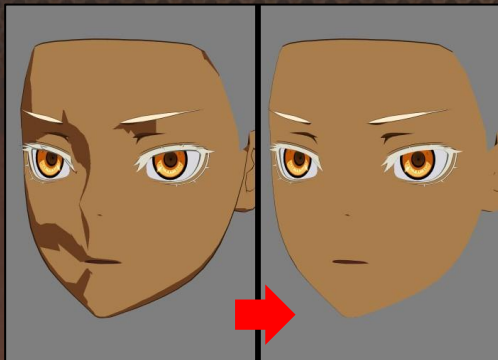
“It there’s a specific shadow shape I really want, I’ll just do it myself!”

⇒ To get fine details and specific shadow shapes that can’t be obtained with transferred normals, you need to edit the normals individually, by hand.

⇒ Mainly used for areas where you want a striking style, such as the face.

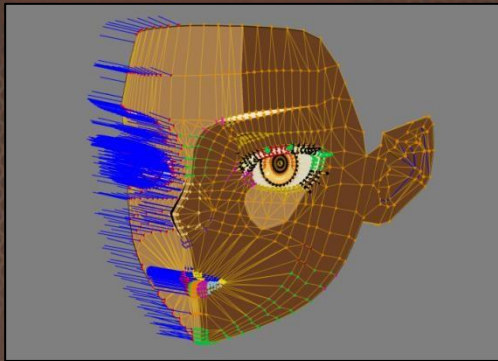
⇒ It would be an unrealistic amount of work to use it throughout the whole body. (Combine the other two methods for this)

Manual Control over Normals



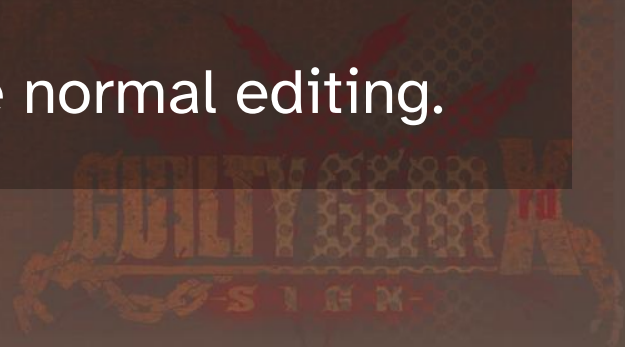
DEMO

Getting rid of messy shadows quickly



DEMO

GGXrd-style normal editing.

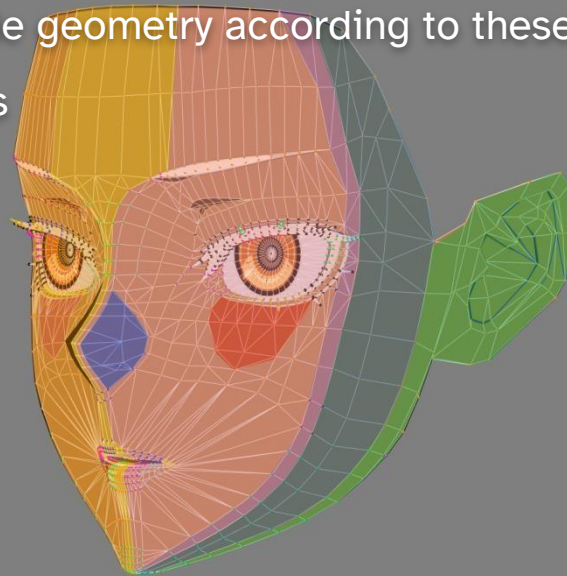


Modeling with manual normal editing in mind

Shading planes (simple example)



Divide geometry according to these areas



- ⇒ Because normals are specified per vertex, you should model with that in mind.
 - You can't reshape a shadow if you have no vertices.
- ⇒ You'll have to split polygons to achieve the desired shadow shape.
- ⇒ Some parts can't be solved well due to the flow of topology, in these cases, you have to use other methods.

Pros and Cons of Normal Editing



Pros of Normal Editing

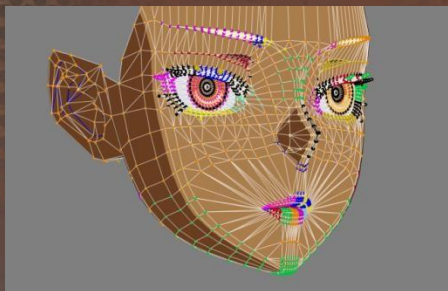


⇒ No messy shadows. You can create the shadows you want.

→The artist's style can be incorporated. You can make your own “illustration”.



⇒The shape of the mesh and the resulting lighting are independent.



⇒You can escape the “curse” of topology. You’ll have more freedom when splitting polygons.

Cons of Normal Editing.

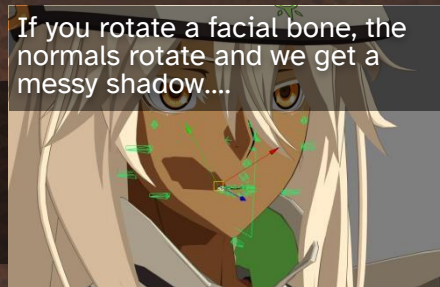
⇒ Bone deformations will rotate the normals, which can break your shadows. A problem when creating facial expressions.

⇒ When creating your inverted hull outline, you need some ingenuity.
(Can't extrude it along the edited normals.)

⇒ Can't be used on subdivided surfaces.
(Because the normals are recalculated.)
→ Could be a problem in non real-time rendering ?¹

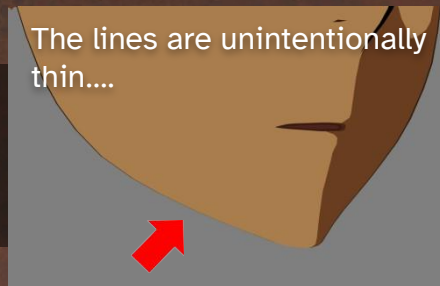
TN¹: Unsure about the translation on this. 映像系で問題になるかも？

If you rotate a facial bone, the normals rotate and we get a messy shadow....

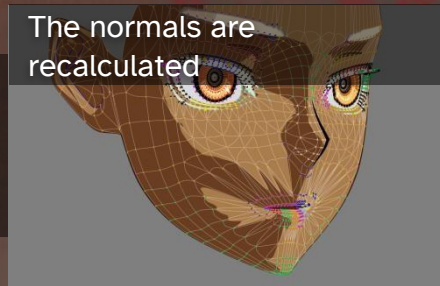


DEMO

The lines are unintentionally thin....



The normals are recalculated



Summary: Practical Normal Editing



Summary: Practical Normal Editing

⇒ There are many methods to control normals, and you can get better results by mastering them within your preferred 3D application.

⇒ Although there are a lot of rules and it's quite a bit of work, **controlling shadows** is worth it.
Especially effective for real-time celshading.

⇒ Vertex Normal editing is a very powerful tool, but there are still few examples of its use, and insufficient research.
We expect several uses and editing tools to show up in the future.

Lastly



About different techniques

Character models are created through a **series of small innovations** such as these.

However, what I showed today are **only a few of many techniques**.

Anime-style character modeling has a very short history, **and there is still room for improvement**.

Today, someone, somewhere, may be discovering a **new technique**.

Or maybe, you'll be the one to find it next.

How to be a good character modeler

- ⇒ Character modeling isn't completed just by creating a mesh.
- ⇒ By acquiring knowledge of other fields, such as rigging, shaders and animation, you will be able to create better and easier-to-use models.
- ⇒ Especially when working with a large team, it means nothing if only the character model is good. Contributing to the quality of the entire project is a must for a good character modeler.
- ⇒ With a broad perspective, let's aim to create models that improve the quality of the entire project!

Staff Recruitment Info

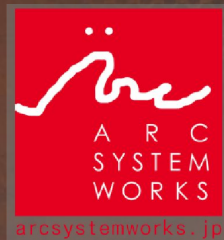
I want to work on models that look like this!

I want to animate models that look like this!

I want to make backgrounds!

I want to make effects!

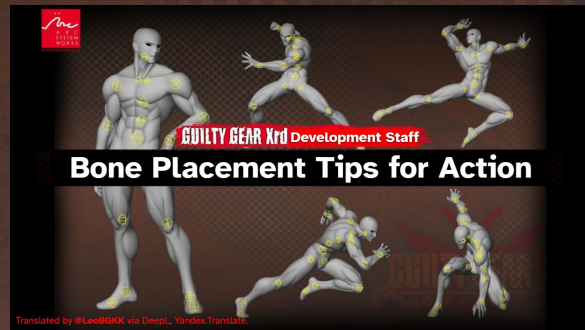
Come to Arc System Works!



MORE INFO

<https://www.arcsystemworks.jp/official/company/whatisarc/>

Other GGXrd 3D Materials



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